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ABSTRACT

Problems related to the handling of hazardous substances and toxic wastes have escalated making this environmental dilemma a national concern. This digest provides an update of key legislative and management efforts associated with hazardous wastes and reviews current instructional materials in the area. Major topics addressed include: (1) waste disposal laws (summarizing major legislative attempts); (2) superfund (describing its intent and parameters); (3) management options (assessing current procedures and techniques); (4) teaching materials (providing a representative sample of materials available in the ERIC system); and (5) additional sources (identifying programs and resources that could assist in the development of instructional materials). (ML)

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TEACHING ABOUT HAZARDOUS MATERIALS

Air quality and surface water quality were the initial concerns of the present environmental movement, because hey are obvious and dramatic. Generally, other waste and hazardous materials concerns received attention in terms of the aesthetic aspects of their presence, in terms of littering or unsightly disposal sites. The concept and practice of underground disposal of both solid and liquid waste materials were generally accepted, even promoted — out of sight, out of mind. It has taken major events such as the Love Canal, Three Mile Island, and Bhopal "incidents" to bring hazardous substances problems forward as necessary, and demanding, for attention. For example, a recent report by the Comptroller General of the United States (1985, p. 1) begins with this statement:

> "Addressing the problems related to the handling of hazardous substances has become a national concern. Hazardous substances can seep into groundwater supplies, contaminate land, and escape into the air, thereby posing real or potential threats of damage to human health and to the environment."

Federal programs dealing with hazardous substances, including their disposal, were initiated by the Solid Waste Disposal Act (SWDA) of 1965; the Resource Recovery Act (RRA) of 1970; the Safe Drinking Water Act (SDWA) of 1974; the Toxic Substances Control Act (TSCA) of 1976; the Resource Conservation and Recovery Act (RCRA) of 1976; the Comprehensive Response, Compensation, and Liability Act (Superfund) of 1980; and the Nuclear Waste Policy Act (NWPA) of 1982. All acts but one focus on waste materials; TSCA addresses the regulation of the more than 43,000 chemicals identified by the U.S. Environmental Protection Agency (EPA) as potentially hazardous to human health (Baldwin, 1985, p. 185). EPA anticipates the addition of thousands of additional chemicals to the list; the current rate of addition is on the order of 1000 per year.

What Laws Deal with Waste Disposal?

The other laws noted above all deal with handling of waste materials, with increasing emphasis over the years on hazardous wastes. SWDA (1975) marked the beginning of the federal government's assumption of a major role in the problem of solid waste, providing federal leadership in research, training, demonstration of new technologies, technical assistance, and grants for state and interstate solid waste planning programs. It concentrated on the concept of conserving natural resources by reducing waste and unsalvagable materials and by solid waste recovery. RRA (1970) emphasized recycling, authorizing funds for demonstration grants for recycling systems and for studies of methods to encourage resource recovery, and required EPA to publish guidelines for construction and operation of solid waste systems. These guidelines are binding on federal agency operations and on federally funded projects (Frost, 1985, p. 27).

EPA's definition of hazardous waste includes waste substances which are flammable, corrosive, reactive, or toxic (U.S. General Accounting Office, 1985, p. 1). EPA has compiled a list of 361 chemicals in 16 categories that pose hazards if improperly discarded (Council on Environmental Quality, 1980, pp. 190 ff.); examples include acids, bases, heavy metals, solvents, pesticides, phenols, methane, polychlorinated biphenyls (PCBs), disease agents, and radioactive isotopes.

SDWA's (1974) purpose is to protect the nation's drinking water by establishing federal standards for substances which may be adverse to human health and to protect underground water supplies by controlling injection of wastes (Frost, 1985, p. 23).

A basic thrust of the RCRA (1976) provisions for hazardous waste management was to establish requirements for the safe treatment, storage, and disposal of hazardous waste. Under the Act, EPA promulgated design and operating requirements for the nation's approximately 5000 treatment, storage, and disposal facilities.

What Is the Purpose of Superfund?

Superfund (1980) was designed to provide for cleanup of the nation's hazardous waste disposal sites, of which EPA has estimated there are more than 18,000 across the country. Included among such sites are abandoned facilities, midnight (illegal) dumps, transportation-related spills, and incineration plants. Superfund was necessary because previous legislation made no allowance for abandoned facilities; it also increased specificity of requirements.

What Management Options Are Available?

Frequently, hazardous wastes are placed in drums, tanks, or other containers, in lagoons or pits, or are scattered or poured on the ground, or are buried. The problem with all of these techniques is the lack of long-term containment; containers may rupture or corrode, lagoons or pits are not sealed permanently, and in all cases the wastes may pollute the soil and, more insidiously, groundwater. Not enough is known about groundwater movement to permit development of a complete assessment of the dangers of such pollution. What is known points clearly to both short-term and long-range negative effects on environmental quality and human health.

The ideal management choice of dealing with hazardous wastes is to lessen quantities generated—by altering industrial processes, industrial outputs, and consumer behavior (Baldwin, 1985, pp. 193 ff.). Once generated, hazardous wastes must be either disposed of or stored. EPA's recommended priorities for waste disposal include recovery and recycling as the preferred alternative, followed by reprocessing (making hazardous wastes less hazardous), then by incineration. For storage, EPA's prioritized alternatives include, in order, deep well injection, solidification and encapsulation, and (as a last choice) disposal in a secure landfill.

What Teaching Materials Are Available?

Teaching about hazardous materials presents many of the same problems as does teaching about environmental concerns in general. Identification of the proper location, or locations, to include such teaching within an existing curriculum is difficult. Locating up-to-date, accurate information and teaching aids useful in such an endeavor is time-consuming, and sometimes appears fruitless. Parallel to public

perceptions of solid waste problems, many educational materials in the general area deal with litter, basically from an aesthetic perspective. Educators have generally followed the public perception that "if we don't see them, they (waste materials) are not a problem."

Again as is typical of environmental topics, most of the available teaching materials dealing with hazardous substances stress either the scientific aspects of the problem or the need for institutional (primarily governmental) responses to them. Thus, teaching about hazardous materials is properly a concern for both science and social studies instruction — and is likely to be incomplete if either aspect is omitted or short-changed. It is to be hoped that developing emphases on science/society/technology/environment teaching and learning will help alleviate this situation.

Nonetheless, teaching materials dealing with hazardous substances have been and are being developed; a number of them have been announced, and are available, through the ERIC system. Noted below is a representative sample of such materials made available through ERIC during the past year.

A secondary school guide presenting toxic waste as an example of a current issue requiring social action is *Investigations: Toxic Waste, A Science Curriculum in the Participation Series*, by Jill S. Goldman and others (1984), produced by Educators for Social Responsibility. A central focus is the skill of investigation as a means of introducing students to emperical methods, to the connection between science and social problems, and to an awareness of environmental issues. Laboratory activities deal with toxic waste and groundwater, testing soil and water, the effects of pH and salt on living organisms, and detection of heavy metals in water.

Teacher's Guide: Educational Materials in Resource Recovery, Grades K-12, by Cathy A. Berg (1984), prepared by the Division of Solid and Hazardous Waste of the Minnesota Pollution Control Agency, contains a bibliography of curricula, audiovisual aids, children's books, and publications about resource recovery, which is presented as a strategy to reduce air and water pollution, to conserve natural resources, and to save energy. The purpose is to promote the goal of reducing dependence on waste disposal by reducing the amount of waste generated and by recovery of materials and energy from waste.

Promoting hazardous materials safety through education is the objective of *Hazardous Materials Emergency Response Training Innovations*, by Leslie Cole (1984), produced by the Council of State Governments and based on the work of the Colorado Training Institute, which has trained more than 3000 emergency response personnel and industry officials through cooperative effort between elements of the public and private sectors.

An Annotated Bibliography of the Literature Dealing with the Hazardous Chemicals Used in the Chemistry Laboratory, by Donna J. Chaney (1984) establishes the need for teachers to be informed of the chemicals which are potential health hazards and indicates that educating laboratory instructors to the hazards of certain chemicals is the necessary initial approach to reducing their dangers in classrooms. Recommendations include the removal of all carcinogenic chemicals from classroom and storage areas, formulation and implementing a predetermined waste disposal program before a laboratory activity is performed, and having all laboratory instructors participate in a formal health safety program.

Designed for secondary school social studies, *Difficult Choices about Environmental Protection, 1984 National Issues Forum*, edited by Keith Melville (1984), prepared for the Public Agenda Foundation, considers the dilemmas and choices confronting Americans concerned with their environment. Hazardous Wastes are a major focus of the presentation.

What Additional Sources Exist?

An ERIC search will locate additional documents of potential use, but not much in the way of "packaged curricula" in this area. Other sources useful in developing instructional materials dealing with hazardous substances include the National Technical Information Service (5285 Port Royal Road, Springfield, VA 22161; 703-487-4650) data base of the U.S. Department of Commerce, which serves as a repository of federal governmental documents in all areas, and the Environmental Quality Instructional Resources Center (1200 Chambers Road, Columbus, OH 43212; 614-422-6717), which catalogs and makes available printed instructional materials, mostly post-secondary, in areas dealing with environmental protection. The Econews Network, a link to cable and Public Broadcasting System stations across the country, supplies television programs dealing with environmental news, interviews, and documentaries, including several pertinent to hazardous substances. These programs are also available for sale and rental in videocassette format; contact Econews, P.O. Box 35473, Los Angeles, CA 90035; 213-559-9160.

The most recent entry in ERIC/SMEAC's series of teaching activity books in areas related to environmental education is *Teaching about Hazardous and Toxic Materials*, compiled by John F. Disinger and Marylin Lisowski. Included are teaching activities and suggestions across the spectrum of hazardous materials topics for grades K-12, generally selected from materials in the ERIC data base and reformatted so as to be particularly useful to teachers. They are organized according to grade level and topic, and keyed to a set of selected concepts.

REFERENCES

Baldwin, John H. *Environmental Planning and Management*. Boulder, CO: Westview Press, 1985.

Berg, Cathy A. *Teacher's Guide: Educational Materials in Resource Recovery, Grades K-12*. 1984 ED 258 835

Chaney, Donna J. *An Annotated Bibliography of the Literature Dealing with the Hazardous Chemicals Used in the Chemistry Laboratory*. 1984 ED 252 379

Cole, Leslie. *Hazardous Materials Emergency Response Training Innovations*. 1984 ED 259 878

Comptroller General of the United States. "Clearer EPA Superfund Program Policies Should Improve Cleanup Efforts." Gaithersburg, MD: U.S. General Accounting Office, GAO/RCED-85-54, February 6, 1985.

Council on Environmental Quality. *Environmental Quality 1980*. Washington, DC: U.S. Government Printing Office, December, 1980.

Disinger, John F. and Marylin Lisowski. *Teaching about Hazardous and Toxic Materials*. Columbus, OH: ERIC Clearinghouse for Science, Mathematics and Environmental Education, December, 1985. SE 046 315

Frost, Sherman L. "One Hundred and Seventy Significant Federal Laws Concerning Natural Resources and Environment and the Creation of Related Agencies, 3rd. ed." Columbus, OH: The Ohio State University, School of Natural Resources, 1985.

Goldman, Jill S. et al. *Investigations: Toxic Waste, A Science Curriculum in the Participation Series*. 1984 ED 254 443

Melville, Keith. *Difficult Choices about Environmental Protection, 1984 National Issues Forum*. 1984 ED 255 432

United States General Accounting Office. "Assessment of EPA's Hazardous Waste Enforcement Strategy." Gaithersburg, MD: U.S. General Accounting Office, GAO/RCED-85-166, September 5, 1985.

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